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C-A OPERATIONS PROCEDURES MANUAL

15.3.3.15 Running Westinghouse MG Set Procedure and Siemens Bus Work

(Booster/AGS Ring Power Supply Systems Group Procedure EPS-S-015)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Approved: Signature on File
Collider-Accelerator Department Chairman Date

M. Bannon

Booster/AGS Ring Power Supply Systems Group Procedure EPS-S-015

15.3.3.15 SWITCHING THE INCOMING AC FEED TO SIEMENS CB-52G— USING THE WESTINGHOUSE MOTOR GENERATOR LOCATED IN BLDG 911W IN PLACE OF THE SIEMENS MG SET

1. All 3 AC Power feeds to Siemens CB-52G must be LOTO. Note: There must be only one power feed hooked up to Siemens CB-52G at any one time.
 - 1.1 The Siemens MG Set must be off (Not rotating and Siemens CB-52 M LOTO)
 - 1.2 The 13.8 KV-AC which feeds the 2.4MW Transformer located in the old RF Yard behind Bldg 928 must be LOTO
 - 1.3 The Westinghouse MG Set must be off (Not rotating-West. CB-52M open and racked out and the West CB-52G must be open and racked out).
 - 1.4 The Kirklock Keys from all 3 AC Power Feeds mentioned in the 3 previous steps must be installed in the top 3 positions of the 7 key tree located on the side of L4 cubicle. When all 3 keys are in tree, turn the bottom key of the tree which will release the 4 bottom keys in this tree which opens cubicles L1, L2, L3 and L4.

THE THREE POWER SOURCES

- 1 Siemens MG Set (Key # RE11273) from Siemens Generator Key Tree.
 2. 2.4MW Transformer (Key # RE1039H) from 13.8kv Air operated switch in Old RF Yard
 3. Westinghouse MG Set (Key #18596) from West. CB-52G in Bldg 911W.
2. Since we are hooking up the Westinghouse MG Set using this procedure, the other TWO other AC feeds must be disconnected.
 - 2.1 To disconnect Siemens Motor Generator Feed to Siemens CB-52G. Disconnect the 12 flexible links located in the cage area above and in front of L4 cubicle. This is the 3 phase output of the Siemens Generator. Remove all hardware and flexible links and keep them inside L4 cubicle so nothing will get misplaced.
 - 2.2 Make sure the feed from the 2.4 MW Transformer is also disconnected. This feed is from the 2.4 MW Transformer – Secondary- which is Switched on and off using a AUTOMATIC CIRCUIT RECLOSER. The load side of this AUTOMATIC CIRCUIT RECLOSER has 3 red 5000V 500 MCM cables going into the Siemens basement to cubicle L4. Make sure these 3 cables are disconnected and taped and tied up out of the way of any bus work.
3. The Westinghouse Motor Generator feed to Siemens CB-52G is located in cage area above L3 cubicle. There are 3 copper bus sections which are the bus links from the output of West. CB-52G. Rotate these links into the run position (AC Feed to Siemens

CB-52G) and bolt them into place. Secure all cage areas back to there original position and install a sign on the door of L4 stating Siemens CB-52G is being fed from Westinghouse MG Set.

4. Since the Siemens MG SET will not be used, it will be necessary not to use many of the interlocks associated with the running of the Siemens Motor Generator Set. We have a Rotary Switch located in Rack 52 where you can select what mode of operation will be used to power the Siemens CB-52G. Rotate this switch to Westinghouse MG Set position. NOTE: This is a PUSH-TO-TURN switch. THIS SWITCH WILL ENERGIZE RELAYS THAT WILL DISABLE THOSE INTERLOCKS NOT NEEDED WHEN RUNNING WITH THE WESTINGHOUSE MG SET. THIS SWITCH ALSO TELLS THE PLC WHAT MODE OF RUNNING WE ARE IN AND MAKES THE APPROPRIATE PLC CHANGES.
5. When running with the Westinghouse MG Set (and also the 2.4 MW Transformer) it is necessary to run with only 2 of the 4 “P” Bank Rectifiers. Therefore MD 3 & 4 must to be bused out of the circuit. And the reference transformer fuses used for the firing bucket for the SCR’s must be removed. Refer to the following pictures on how to bus out MD’s 3 & 4. When reference transformer fuses are pulled leave them inside the rectifier MD’s 3 & 4 so they can be put back when we runs Siemens MG set.
6. Refer to the Westinghouse Start-up and Run Procedure for Westinghouse MG Set operations.(Attached below)

PROCEDURE FOR THE START-UP OF THE WESTINGHOUSE MG SET AND EXCITATION OF THE WESTINGHOUSE GENERATOR

DATE: SEPTEMBER 26, 2000 (Rev. G 08/10/2006)

WRITTEN BY: MICHAEL BANNON

APPROVED BY: _____

APPROVED BY: _____

Revision: D (01/31/01)
Revision: E (12/07/01)
Revision F: (08/10/04)

PROCEDURE FOR THE START-UP OF THE WESTINGHOUSE MG SET AND EXCITATION OF THE WH GENERATOR

1. Purpose

The purpose of this procedure is to define the steps to be used in the initial start-up of the Westinghouse Motor-Generator (MG) Set.

Also, it defines the responsibilities of the individuals involved.

2. Responsibilities

- 2.1 Only individuals involved in the design and construction of the W MG Set shall be involved or trained operators on the Westinghouse M-G Set systems. (See attached list of SPECIALISTS).
- 2.2 The designated RESPONSIBLE operator shall be listed on the BULLETIN BOARD just outside the MG CONTROL ROOM. This name shall be updated on each shift change.
- 2.3 Electrical/mechanical DATA will be taken each shift and recorded on the data sheets inside control room. .

3. Prerequisites

- 3.1 All persons involved shall be trained in the manual tripping of the main circuit breaker feeding power to the MG Set (52CB).
- 3.2 All persons involved shall be trained in the operation of the new Control System of the MG Set.
- 3.3 Proper LOTO and testing procedures shall be followed at all times.
- 3.4 Informing of all affected persons and the Maintenance Coordinator shall be conducted prior to commencing of turning on the set.

4. Precautions

- 4.1 Proper postings shall be in place.
- 4.2 Hearing protection measures shall be strictly adhered to.
- 4.3 Check with MCR to make sure the power is available prior to starting up.
- 4.4 Check that all cooling systems are operating (includes water and air).

- 4.5 Verify in Bldg. 928 the only feed connected to 52G Siemens is from the Westinghouse.

Westinghouse Bus Links connected	[]
Siemens Bus Links disconnected	[]
Transformers cables disconnected	[]
- 4.6 In Rack 52 in Bldg. 928 old control room move rotary switch to Westinghouse Run Mode.
- 4.7 Circuit Breaker 57G (Generator Brake) in Bldg 928 must be disabled when running Westinghouse motor Generator Set. (PL8)
- 4.8 Verify no one is in Fan House in the Westinghouse Area.

5. Procedure

- 5.1 Electrical/mechanical DATA will be taken each shift and recorded on the data sheets inside control room. This shall be documented in the LOG BOOK (See 6.0).
- 5.2 Make sure that all affected persons are notified.
- 5.3 Turn on all control power, i.e. 110VAC CB'S house power to racks in control room and speed room, 110VAC CB'S UPS PWR to racks in control room and speed room, 120VDC BATTERIES(charger 5550A is –"on",100amp CB inside battery enclosure-closed, and 100 amp CB in Rack 5534- closed), 208VAC 3PH (FDS A11-NE5) for lift pumps is closed , 480VAC 3PH.(FDS DP-A44-1 ckt #4) for hydraulic pump is closed and 3 FDS 'S for fans 1,2,3 in fan house are closed.(refer to block diagram). Also heaters must be turned off in the motor and generator when MG Set will run.(FDS-A11-NE6) **(CAT 2 – PPE)**
- 5.4 Unlock and turn on BRAKE PS FDS-566A.
- 5.5 Make sure 13.8 KV POWER IS AVAILABLE and ON in cubicle #3 next to CB-52 incoming 13.8 KV from 911-13.
- 5.6 Rack in CB52B first, and then CB52. After both circuit breakers are racked in, close the knife switches located on the upper left side of the breaker cubicles. **(CAT 4 –PPE)**
- 5.7 Check that all W MG Instrumentation is ON and functioning.
- 5.7A Turn the manual/auto switch of the Fans to manual (Rack 5534). Turn on all three fans-1,2,3.(0) **(Note: For winter running when it is cold outside leave then fans off on startup. After the set has been running for a while monitor the mg set room temperature from Rack 5530 Panel View monitor and turn on the fans as they are needed.)**

Motor Section (1)

- 5.8A TO TURN THE MOTOR ON: At the NEW CONTROL CONSOLE Rack 5531 in the NEW WESTINGHOUSE CONTROL ROOM, turn local/remote switch of the **motor controls section** to “local”, then press the STANDBY (STBY) PB at the **motor controls section** of the control panel. **(1)**
- 5.8B Do a walk through of the MG Set room making sure no unauthorized persons are in the room and it is ready to turn “on” and record the pedestal pressures as per the start-up sheet with lift pumps “on”. Lock door so no unauthorized personnel can enter the room after the walk through is over.
- 5.9 Press (STBY) PB at the **motor controls section** once again to RESET all FAULTS. Note: All motor interlocks must be clear then press (STBY) PB again and reset both PL7 lockout relays together first then press (STBY) PB again and then both PL6 lockout relays together. **(1)** Note: If PL7 or PL6 lockout relays do not reset check the panel view screen in Rack 5530 for PL7 and PL6 faults.
- 5.9A Verify the Brake PS is “ON”. (Turn on locally if the remote “ON” did not work.)
- 5.9B Verify the 120 VDC is good in Rack 5534.
- 5.10 Check PANEL VIEW screen in Rack 5530 for any PL6 or PL7 FAULTS listed. If there are no faults the motor is ready to be turned on.
- 5.10A Record/Verify the flows and pressures as per the start-up with lift pumps on sheet.
- 5.10B Verify there no “Warnings” on the Panel View screen under the 3 pages of warnings. (Note: If warnings exist call a systems specialist to assist.)
- 5.10C Verify Liquid Rheostat is at 100% in Rack 5531.
- 5.11 Close 52 CB by pressing the (ON) PB in Rack 5531 **motor controls section**. **(1) Record time the motor was turned “ON”.**(Motor will begin to rotate. After approx. 500 rpm verify the Liquid Rheostat starts to move towards “0” %.) The circulating pump may have some cavitation between 200-400 RPM’s. (Note: motor must come up to speed within 9 minutes or it will trip)
- 5.12 The MG SET is self-protecting, however if you observe any abnormal condition, APPLY the MOTOR BRAKE by pressing the 52B BRAKE (ON) PB or, Alternately press the EMERGENCY CRASH PB ON MAIN CONSOLE. (Note: do not apply brake if below 750 RPM) Max. RPM of this motor is 890 RPM’S.

- 5.13 To turn the motor “OFF”: Press the (STBY) PB in Rack 5531 **cycloconverter section** first which will unlatch the bridge of the liquid rheostat. Then press the (STBY) PB in Rack 5531 **motor controls section** to bring SET from ON to STBY. Then apply the Brake-CB-52B by pressing the Brake CB-52B Close PB in Rack 5531 and observe that the Brake PS current reads approx. 300 amps. (Note: The Liquid Rheostat should begin to go to 100% and the Lift Pumps should turn “ON” at approx. 800 rpm if they DO NOT press the Emergency Lift Pump “ON” PB in Rack 5531. It should take approx. 3-4 minutes for the Motor to come to a complete stop. If the CB_52B does not automatically OPEN after the set reaches “0” RPM’S, OPEN it manually by pressing the CB-52B open PB in Rack 5531.

HYDRAULIC SECTION (MOTOR MUST BE @ 890 RPM’S) (2)

- 5.14 HYDRAULICS: To operate the Hydraulic portion of the W MG Set, use the **CYCLOCONVERTER Section (2)** of the NEW CONTROL CONSOLE Rack 5531(right half). Turn the local/remote switch of the **cycloconverter section (2)** to (local). Set the TV camera so the top of the Liquid Rheostat platform can be seen. Press the (STBY) PB of the **cycloconverter section** until blinking light stops and fault light clears and then press the (ON) PB of the **cycloconverter section**. When the On light blinking stops the hydraulic system pump is ON and observe the Liquid Rheostat PLATFORM will latch. To TURN OFF the hydraulic pump press the (STBY) PB of the cycloconverter section once again.

EXCITER POWER SUPPLY SECTION (3)

- 5.15 Rack in CB-52G Westinghouse.
- 5.15 EXCITER: Turn on the FDS switch labeled 911N Ckt 43A for the exciter power supply. To operate the Exciter portion of the W MG Set, use the EXCITER controls **(3)** located in Rack5534 of the WH control room. Make sure the local/remote light is on. Press the (STBY) PB until blinking stops and the FAULT light clears. If the FAULT LIGHT does not clear press (STBY) PB again to reset latched interlocks. Then press (ON) PB and the exciter power supply should turn “ON”. Note that the generator voltage won’t come on until 52G at SIEMENS BLD 928 closes. If the exciter needs to be tested certain PLC interlocks must be bypassed. This can only be done by the qualified PLC/interlocks expert.
- To turn the Exciter power supply “OFF” press (STBY) PB once again. **(3)**

RECTIFIER SECTION (4)

- 5.16 RECTIFIERS: (Note: The interlock switch located in Rack 52 at Siemens (Bldg 928 old control room) must be in the **Westinghouse Mode** position and the power feed to the 52G breaker at Siemens –Links from the Westinghouse are in and the Siemens links and the transformer cables are disconnected.

Check that Rect. Mod. #2 & 3 have their firing pulses removed and they have been bused out of the circuit.(Mod. 1 & 4 “P” Bank modules and Mod. 5,6,7,8 “F” bank modules are used when running the Westinghouse motor generator or the 2.4 mw transformer.) Verify 52G -Westinghouse is racked in. Load the functions of the cycle to be tested and check all references on the oscilloscope to make sure they were loaded properly in Rack 5533.(Note: Verify the sun station is running the MMPS program in the Westinghouse mode.) To operate the Rectifiers use the RECTIFIERS controls located in rack 5532 of the WH control room. Turn the local/ remote switch to “local”. Press (STBY) PB until blinking light stops and the FAULT light clears, this will CLOSE CB-52G Westinghouse and you should reset the PL4 lockout relay in Rack 5532 now. If the FAULT LIGHT does not clear press (STBY) PB again to reset latched interlocks. Check the signals loaded into the buffers to each pair of rectifier modules by checking the BNC references in Rack 5533. Always check the computer generated power reference in Rack 5533 and compare it with the computer generated power reference in the AGSMM program. If there are differences notify the system engineer. If all looks ok press the (ON) PB and the 52G BREAKER at Siemens should CLOSE (this can be monitored on the Panel View screen in Rack 5530). Note that the generator voltage will come on first (in Rack 5534 generator output voltage should go to 7000VAC, if over, press the STBY PB and call system expert. Then the power supply should start following the computer references.. If power is swing more than 1 mw check the power reference on the BNC in Rack 5533 and compare it with the computer generated reference in the AGSMM program, then call the system engineer.

5.17 To turn the rectifiers “OFF” press (STBY) PB once again.

6. Documentation

6.1 Operations LOG BOOK shall be started and ALL pertinent entries made.

6.2 DATA shall be recorded by the shift operator. The Responsible Group Leader shall initial the log book and make sure that data is recorded daily.

7. References

7.1 See Testing Procedure and DATA used during the NOV'98 Runs of the W MG Set as it existed prior to the UPGRADE.

7.2 Also, reference shall be made to the old W drawings and the new schematics.

8. Attachments

8.1 List of Specialists

8.2 Checklist for Westinghouse Turn “ON”.

ATTACHMENTS 8.1 - LIST OF SPECIALISTS

- 1) J Sandberg
- 2) I. Marneris
- 3) V. Badea
- 4) R. Bonati
- 5) W. Eng
- 6) P. Rosas
- 7) M. Bannon
- 8) G. Danowski
- 9) S. Savatteri
- 10) J. Funaro

LIST OF TRAINED SHIFT OPERATORS

- 1.) J. Mingoia
- 2.) J. Galarraga
- 3.) C. Watts
- 4.) J. Famiglietti

8.2 CHECKLIST FOR WESTINGHOUSE TURN “ON”

By: _____ Date: _____

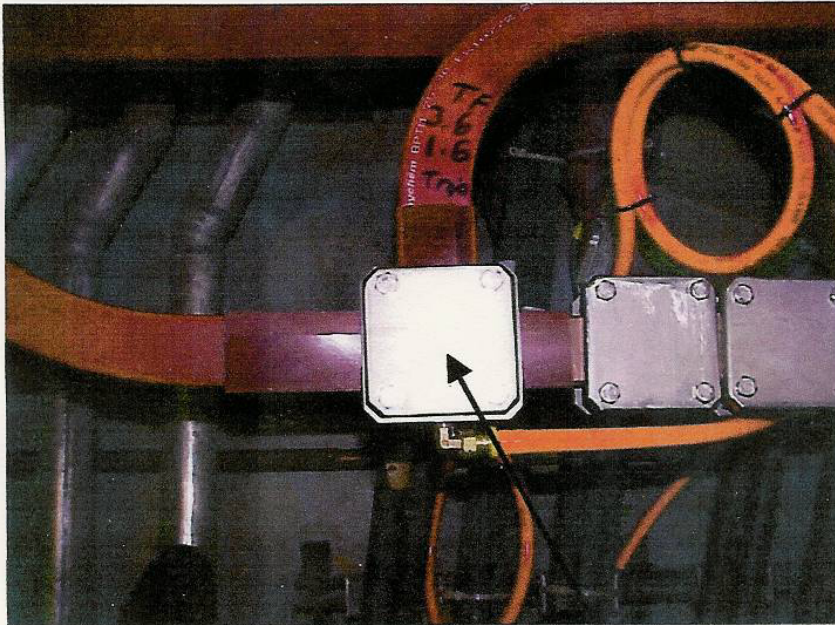
1. Three possible power sources to CB 52G Siemens are LOTO.
 - A. Westinghouse 52G []
 - B. 2.4 MW Transformer 13.8 KV switch, verify contact have opened []
 - C. Siemens 52G open and 89 SW'S open and key from LE1 []
2. Westinghouse output links installed Above L4-52G Siemens. []
3. 2.4 MW Transformer cables are disconnected in L4 @ Siemens. []
4. Siemens generator output links removed. (Cage area above-front of 52G Siemens) []
5. Rotary switch in **Westinghouse Position**. (Rack 52 in Siemens old Control Room. []
6. Relays in LA73 D7201 & D7202 are removed from there sockets. []
7. Ensure CB 57G cannot close by disabling its CLOSE command. []
8. Unplug the firing plugs in Siemens Rect. Modules 2 & 3. []
9. Change the current loop gain pot in Mod 5 from setting of 9 to setting of 7 []
10. In Rect. Modules MD 1 & 3 --- the following resistor on the voltage regulator BRD. in MD 1 (R28) , in MD 3 (R29) must be taken out of circuit using the headers on the board to take resistors in and out of circuit. []
11. Remove the reference transformer fuses in MD# 2 & 3 and place them in the front binder holder. []
12. Check the Siemens to Westinghouse buffer chassis in Rack 5086A in the new Siemens Control Room is “ON”. []
13. Set the 81P relays in Rack LA73 to 70 % tap, all four 81 P Relays (overvoltage relays). []
14. All Kirklock keys in key tree in LE1 at Siemens for run mode. []
15. All Kirklock keys in key tree at Westinghouse for run mode. []
16. Signs installed on 52G Siemens stating we are running from Westinghouse. []
17. DC Output bus configure for Westinghouse run (Only 1 “P” Bank PS in parallel with two “F” Banks. MOD 2 & 3 are not used and are bused out. []
18. FDS 208 VAC 3 PH for lift pumps is “CLOSED” “ON” (A11-NE5) []
19. FDS 208 VAC 3PH for heaters is “OPEN” “OFF” (A11-NE6) []
20. FDS 480 VAC 3PH for hydraulics is “CLOSED” “ON” (DP-A44-1-FS-#4) []
21. FDS 480 VAC 3PH for 3 intake air fans is “CLOSED” “ON” []
22. 120 VAC UPS PWR CB'S are “ON” UPS 3PP1 CB'S 1-10, 12, 14, 16, 18. []
23. 120 VAC house PWR CB'S are “ON” DP-A44-1-7-A-1 CB'S 1-11,13,15,17,19. []
24. 120 VDC control PWR “ON” (100A CB Inside Battery Bank) []
(100A CB in Rack5534 Control Room) []

- | | | |
|-----|--|-----|
| 25. | The following CB'S are racked into the run position at West- CB-52 | [] |
| | CB-52B | [] |
| | CB-52G (W) | [] |
| 26. | FDS 480VAC 3PH for brake PS unlocked and "CLOSED" "ON". | [] |
| 27. | FDS 480 VAC 3PH for exciter PS unlocked and "CLOSED" "ON" | [] |
| 28. | .Circuit breaker outside for exciter PS is "CLOSED" "ON" | [] |
| 29. | Knife switch inside CB-52 cubicle is "CLOSED". | [] |
| 30. | Knife switch inside CB-52B cubicle is "CLOSED". | [] |
| 31. | Visual inspection of motor-generator area completed. | [] |
| 32. | Visual inspection of Westinghouse area completed. | [] |
| 33. | Visual inspection under Westinghouse MG Set Motor-Generator pits. | [] |
| 34. | Oil pit area checked. | [] |
| 35. | Affected personnel in Bldg. 928 have been notified of testing. | [] |
| 36. | MCR notified of Westinghouse MG Set will be turned on | [] |
| 37. | Follow start-up procedure for Westinghouse. | [] |

Additional changes made at Siemens (on 02/01/01)

1. In MD # 1 Siemens Dwg =1.U2+B21F1 SH.2 PCB –A26.1 & A26.2. We install a .22 UF cap across the .1 UF cap which already was installed across resistor R108 and R34.
2. In MD # 1 & 3 set the low voltage setting on the VDRV. PCB to 1.1 volt for west running. It was set for 1.0 volts when running Siemens (max. invert voltage).
3. In MD # 1 & 3 installed another 10K .1% resistor across R18 on the VDRV PCB (this reduces the loop gain by a factor of 2)
4. Swapped MD @ & # filter BRDSs for a test

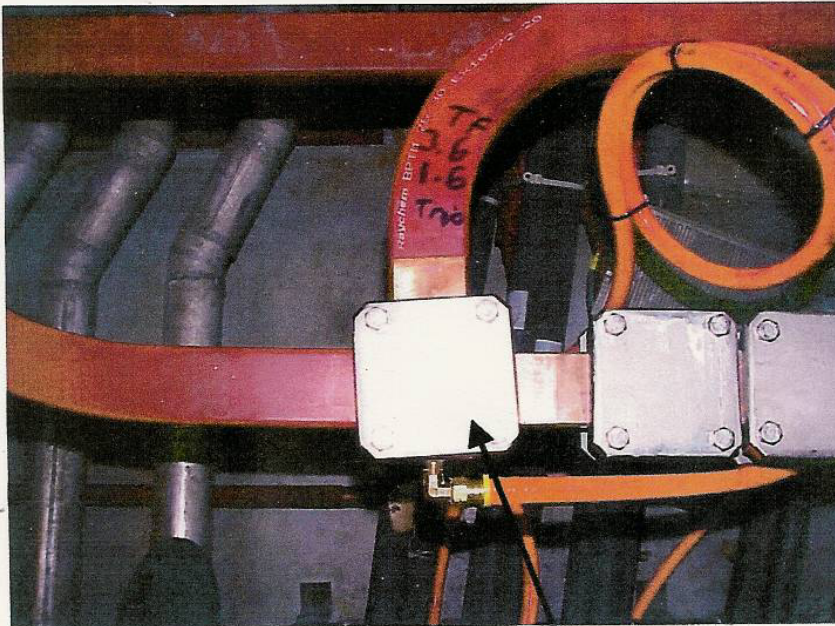
RECTIFIER BUSS LINK POSTIONS LOCATION 3



Buss link jumper is installed as shown. There is **NO ELECTRICAL CONNECTION.**

Bolt torque specification 236

BUSS LINK INSTALLED FOR **SIEMENS** OPERATION

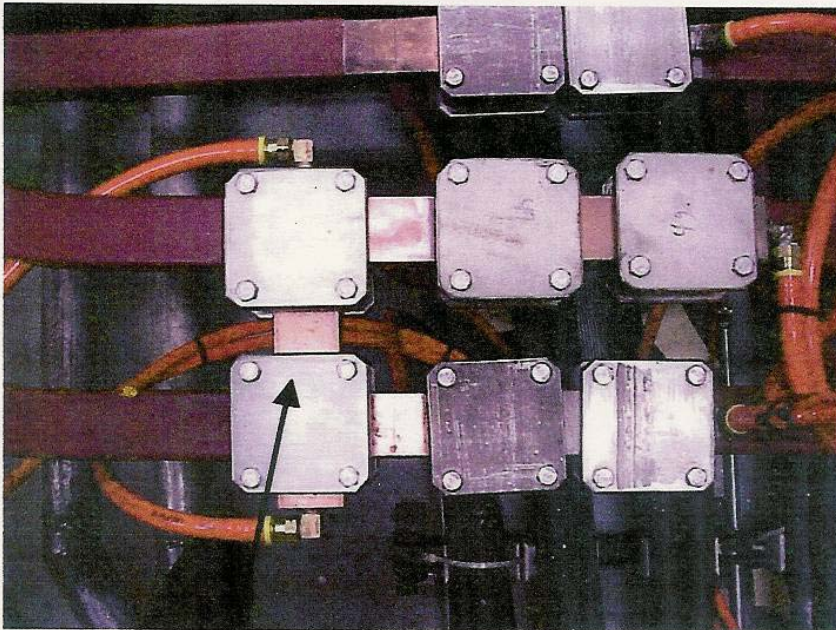


Buss link jumper is installed

Bolt torque specification 236 in lbs.

BUSS LINK INSTALLED FOR **WESTINGHOUSE** OPERATION

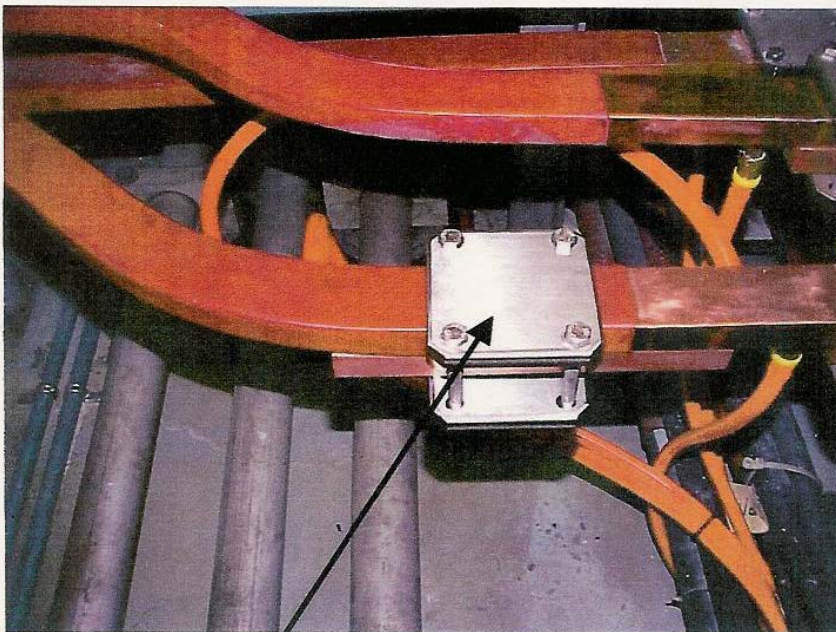
RECTIFIER BUSS LINK POSTIONS LOCATION 4



Buss link jumper is installed as shown.

Bolt torque specification 236 in lbs.

BUSS LINK INSTALLED FOR **SIEMENS** OPERATION



Buss link is clamped to existing bus for support only. There is **NO ELECTRICAL CONNECTION.**

Bolt torque specification 236

BUSS LINK INSTALLED FOR **WESTINGHOUSE** OPERATION

8.3 CHECKLIST FOR SIEMENS OPERATION AFTER RUNNING WESTINGHOUSE.

1. Three possible power sources to CB 52G Siemens are LOTO.
 - A. Westinghouse 52G []
 - B. 2.4 MW Transformer 13.8 KV Switch, verify contact have opened []
 - C. Siemens 52G open and 89 SW'S open and key from LE1 []
2. Westinghouse output links removed above L4-52G Siemens. []
3. 2.4 MW transformer cables are disconnected in L4 @ Siemens. []
4. Siemens generator output links connected (cage area above-front OF 52G Siemens) []
5. Rotary switch in **Siemens position**. (Rack 52 in siemens old Control Room.) []
6. Circuit Breaker 57G (Generator Brake) in L4 re-enabled (PL8) []
7. Relays in LA73 D7201 & D7202 are reinstalled in there sockets []
8. Plug the firing plugs in Siemens Rect. Modules 2 & 3. []
9. In Rect. Modules MD 1 & 3 – The following resistors on the voltage regulator BRD in MD 1 (R28), in MD 3 (R29). (Both 13K .1%) have to be put back into the circuit using the header jumper.. []
10. Reinstall the reference transformer fuses in MD # 2 & 3. []
11. Move “T” loop pot in MD # 5 from 7 to 9 setting on dial pot. []
12. Set the 81P relays in Rack LA73 TO 55 % tap all four 81 P relays (overvoltage relays) []
13. All Kirklock keys in key tree in LE1 at Siemens for run mode. []
14. Signs installed on 52G Siemens stating we are running from Siemens MG Set. []
15. Configure the DC output bus - for Siemens running - (all PS used -- two “P” Banks in parallel with two “F” bank rect. modules bank rect. modules – in each station.) []